

## **REMARKS**

Applicant is in receipt of the Office Action mailed April 23, 2003.

Claim 8 was cancelled. Claims 1, 7, 12, 18, 23, and 29 were amended. New claims 34-43 were added. Thus, claims 1, 3, 5-12, 14, 16-23, 25, and 27-43 are pending. In the Office Action, claims 1, 3, 8-12, 14, 19-21, 23, 25, and 30-32 were rejected under 35 U.S.C. § 102(e) as being unpatentable over Franck et al. (U.S. Patent No. 6,351,662).

It was also stated in the Office Action that claims 5-7, 16-18, 22, 27-29, and 33 would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claim 8 was cancelled, and so the 102(e) rejection is rendered moot. Applicant respectfully traverses the § 102 rejection of claims 1, 3, 9-12, 14, 19-21, 23, 25, and 30-32 under 35 U.S.C. § 102(e) as being unpatentable over Franck.

Amended claim 1 recites:

1. (currently amended) A method for scanning for an object within a region, comprising:

scanning the region using a conformal scanning scheme, said scanning comprising:

performing a conformal mapping between a characteristic geometry of the region and a first scanning curve to generate a conformal scanning curve based on said characteristic geometry, wherein the first scanning curve is comprised in a first geometry, wherein the first geometry is different from the characteristic geometry of the region, wherein the first scanning curve comprises a sequence of points in the first geometry, and wherein said performing a conformal mapping between a characteristic geometry of the region and a first scanning curve comprises:

determining a mapping function which maps each point in the first geometry to a corresponding point in the characteristic geometry; and

applying the mapping function to each point in the sequence of points in the first geometry to generate a corresponding sequence of points in the

characteristic geometry, wherein the sequence of points in the characteristic geometry comprises the conformal scanning curve; and

measuring the region at a plurality of points along the conformal scanning curve using one or more sensors;

determining one or more characteristics of the object in response to said scanning;

and

generating output indicating the one or more characteristics of the object.

The Office Action asserts that Franck discloses a method for scanning for an object within a region, comprising scanning the region using a conformal scanning scheme, said scanning comprising performing a conformal mapping between a characteristic geometry of the region and a first scanning curve to generate a conformal scanning curve based on said characteristic geometry; and measuring the region at a plurality of points along the conformal scanning curve; determining one or more characteristics of the object in response to said scanning; and generating output indicating the one or more characteristics of the object, referencing fig. 5, and col. 8, lines 29-35 of Franck.

Applicants respectfully disagree, given that the cited figure and passage neither teach nor suggest generating a conformal scanning curve based on a first scanning curve (using a conformal mapping between a characteristic geometry of the region and the first scanning curve), and then *measuring the region at a plurality of points along the conformal scanning curve*, i.e., scanning the region using the conformal scanning curve, to determine characteristics of the object. In fact, in Franck's system, the object (e.g., a human head) is scanned first, in order to generate a 3D image of the head, then a conformal map determined, and used to generate a synthesized image of the object (e.g., the human head), which is then used to coordinate surgical procedures.

In other words, in Applicants' system, the purpose of generating the conformal map is to produce the conformal scan curve (from the first scanning curve) which is then used to scan the region in order to measure characteristics of the region or object, whereas in Franck's system, the converse is true, namely that the object is scanned first to generate an image, which is then used to generate the conformal map. The conformal

map is used to juxtapose positions (e.g., of markers, surgical tools) related to the actual object onto the image, thus allowing the surgeon to closely track and control surgical incisions. Thus, in Franck's system the conformal map is not used to generate a conformal scanning curve for scanning the object, and thus does not read on Applicants' invention.

Applicants further note that the amended claim 1 includes a further crucial distinction over Franck. Specifically, in Applicants' system the first geometry (which includes the first scanning curve) is different from the characteristic geometry (of the region). As described at length in the present application, the scan region's characteristic geometry is typically a square, circle, rectangle, etc. (p 35, lines 7-9), whereas the first scan curve is a scanning path in a different geometry, such as an Archimedes Spiral or a Low Discrepancy Sequence in a differently shaped region. For example, as described in the first paragraph page 36, a conformal map is determined between a circular Archimedes Spiral (the first scanning curve) and a square region, and used to map the Archimedes Spiral to a "square spiral" scanning curve (the conformal scanning curve). Thus, a crucial feature of the claimed invention is that a scanning curve in a first geometry is mapped (via the conformal map) to a conformal scanning curve in a *different* geometry.

In contrast, in Franck's system, the conformal map is between an image of the object (e.g., a 3D image of the human head) and the object itself (e.g., the human head). In other words, the "characteristic geometry" of the image and the "first geometry" of the object are the same geometry, since each describes the object (e.g., the human head). Thus, while the coordinate systems used to denote positions in the image and the object may differ by a translation and rotation, the actual geometries are the same. This is made particularly clear in Franck in column 8, lines 29-35, and in column 9, lines 9-33 as well as in other portions of Franck, where it is stated that the conformal map is used to form a composite image from the scanned image and the tracked positions of the object markers and surgical probes/instruments. In other words, the two geometries are juxtaposed to provide a combined view to the surgeon, so that the surgeon can "see" the

probe/instrument in the 3D image. This type of composition would not be feasible if the two geometries were dissimilar.

Thus, for at least the reasons given above, the system of Franck does not teach or suggest Applicants' invention, and so Applicants respectfully submit that the amended claim 1 is allowable. Furthermore, since claims 3, 5-7, and 9-11 depend from claim 1, those claims are allowable. Additionally, new claim 34 depends from claim 1, and so is similarly allowable. New independent claim 35 contains the limitation that the first geometry and the characteristic geometry are different, and so is allowable for at least the reasons given above.

Independent claims 12 and 23 contain similar limitations as claim 1, and so Applicants submit that claims 12 and 23 are allowable for at least the reasons provided above. Furthermore, because dependent claims 14, 16-18, and 19-22 depend from claim 12, those claims are also allowable. Similarly, because dependent claims 25 and 27-33 depend from claim 23, Applicants submit that those claims are also allowable.

In the Office Action claims 5-7, 16-18, 27-29, 22, and 33, were objected to as being dependent upon a rejected based claim, but would be allowable if rewritten in independent form including all the limitations of the base claim and any intervening claims. New claims 36-43 are respective independent claims that include the respective limitations of those claims, and so are allowable for that reason.

## **CONCLUSION**

Claim 8 was cancelled. Claims 1, 7, 12, 18, 23, and 29 were amended. New claims 34-43 were added. Thus, Claims 1, 3, 5-7, 9-12, 14, 16-23, 25, and 27-43 remain pending in the case.

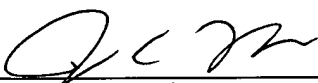
In light of the foregoing amendments and remarks, Applicants submit the application is now in condition for allowance, and an early notice to that effect is requested.

If any extensions of time (under 37 C.F.R. § 1.136) are necessary to prevent the above referenced application(s) from becoming abandoned, Applicant(s) hereby petition for such extensions. If any fees are due, the Commissioner is authorized to charge said fees to Meyertons, Hood, Kivlin, Kowert & Goetzel PC Deposit Account No. 50-1505/5150-53101/JCH.

Also enclosed herewith are the following items:

- ☒ Return Receipt Postcard
- ☒ Request for Continued Examination
- ☒ Fee Authorization

Respectfully submitted,

  
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